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*Second Report of a Committee of the Statistical Society of London, appointed to collect and enquire into Vital Statistics, upon the Sickness and Mortality among the European and Native Troops serving in the Madras Presidency.**

YOUR Committee, in accordance with the intention expressed in their former Report, have examined the documents collected and brought before them by Mr. Annesley, relating to the sickness and mortality of the European and Native Troops serving at Moulmein on the Tenasserim Coast, at Penang, Malacca, and Singapore; and they propose, in their present Report, to submit to the Society the result of their investigation, prefacing it with a few observations on the local peculiarities of the several settlements under review.

The coast of the Tenasserim provinces extends from the 11th to the 17th degree of north latitude, the territory itself being bounded by the kingdom of Siam on the east, and the Burman empire on the north.

Nearly the whole of this immense territory is totally uncultivated, and still in a state of nature, covered in some parts with dense forests, and in others stretching into open plains many miles in extent, but frequently without a single inhabitant. The population is principally congregated in the vicinity of the three principal towns of Moulmein, Tavoy, and Mergui, the former of which, being the head-quarter station of the troops, particularly merits description.

It was founded in the year 1827, on the cession of these provinces to the British, when it became necessary to establish a large force as near as possible to the Burmese frontier. It is situated about 30 miles up the Saluen, a river nearly two miles broad, which there forms a junction with two other rivers of considerable size. The native town is on the river side, but the cantonments occupy a sloping bank about a quarter of a mile beyond it, and having a ridge of hills about 200 feet in the rear, which extends along the course of the river to the sea. On the opposite side, and a little to the north, is the town of Martaban, belonging to the Burmans, the course of the river serving as the boundary between the two countries. With the exception of several limestone rocks, which rise in most fantastic shapes from the plain, and the sandstone ridge before referred to, the whole country for many miles around is nearly a dead level, completely inundated during the rainy season, and remaining for several months after that period in a marshy state. At the distance of 20 or 30 miles, a range of hills from 1,000 to 2,000 feet in height, backed by others of immense elevation, shuts in the prospect to the north and east, while the level land continues to stretch away to the southward.

So level is the general character of the country in this part, that it has been computed that no less than 5,000 square miles are annually inundated by the overflowing of the river. The soil is consequently alluvial, with the exception of the ground on which the cantonment stands, which consists of sand, pipe-clay, and a species of iron-stone.

Dense forests, or interminable jungle, cover the greater part of the surface. In some parts, however, there are extensive plains several miles in extent, free from trees, but covered with a coarse rank grass: the banks of all the rivers, within reach of the tide, are thickly studded

* For First Report, see vol. iii., p. 14

with mangrove bushes. The population is exceedingly scanty; sometimes in a whole day's journey not an individual nor a habitation will be met with. Owing to this circumstance the extent of cultivation is very limited, though from the facility afforded by the inundation, little else is required than to cast the seed into the ground and return at the proper season to reap the produce.

The climate is principally distinguished for its extreme moisture; the average quantity of rain which falls is about 200 inches annually, or five times as much as in Britain. There are two seasons, the wet and the dry; the former commencing in April or May, and continuing till October, the other occupying the rest of the year; and as about 160 inches of the rain falls in the four months when the monsoon is at its height, the torrents in which it pours are really beyond description. Westerly winds prevail during the greater part of the year, and coming direct from the ocean are cool and refreshing. Indeed, with the exception of two months of the dry season, the temperature is considerably below the usual average in tropical climates.

The Peninsula of Malacca, or the Malayan Peninsula, as it is sometimes called, adjoins the southern extremity of the Tenasserim coast. It extends from the 1st to the 11th degree of north latitude, its estimated length being nearly 775 miles, and its average breadth about 125 miles. A range of lofty hills, whose bases are covered with a thick and almost impenetrable forest, extends from one extremity to the other; whilst innumerable streams descending from them on either side, supply, as they direct their course to the sea, the demands of a luxuriant vegetation.

On the eastern side of this narrow tract the sea is comparatively open and unobstructed. The western side, on the contrary, presents a continual succession of islands, increasing in number towards the southern extremity of the peninsula, and affording scenes of verdant and picturesque beauty, not exceeded in any part of the world.

Amongst these are the islands of Singapore and Penang; the former of which is situated at the southern extremity of the peninsula, from which it is separated by a narrow channel. The island itself is of an elliptical form, being about 27 miles in its greatest length, and 15 in its greatest breadth (averaging, according to another authority, 24 miles in length and 10 in breadth), and containing an estimated area of 270 square miles.

The eastern side of the island is generally low and flat, and has at some former period been partially covered by the sea. The western part presents an undulating surface; but there are no hills of any considerable elevation. One alone, according to Earle, attains a height of 1,500 feet. The eastern portion of the island is interspersed with fresh-water marshes, and its northern coast is skirted by extensive mangrove swamps, which, at some points, advance inland to a considerable distance. The fresh-water marshes are loaded with rank vegetation, the jungle upon them being literally impenetrable. The town is situated at the southern extremity of the low land above described, in Lat. $1^{\circ} 16' 2''$ N, and Long. $103^{\circ} 53' 2''$ E. It is built on the banks of a creek, which is navigable for the largest cargo-boats, and which at high tide overflows an extensive mangrove swamp, from which nearly all the ground, now occupied by the town, has been recovered.

Mr. Crawford, who was charged with the local administration of the settlement for a period of three years, states that its site and neighbourhood are composed of red sandstone, with occasional beds of shale, cellular clay iron ore, jaspery iron ore, and conglomerate; but that there are traces of granite in the northern and eastern portions of the island which are adjacent to the continent.

The climate of Singapore, from the absence of distinct seasons, is subject to little variation. The thermometer ranges throughout the year from 70° to 90° , and refreshing showers are frequently experienced. The greatest quantity of rain falls in December and January, and these are the coldest months; the hottest and driest are April and May. On an average of 4 years, 185 days were rainy, and 180 dry; during the north-east monsoon, from October to March, the settlement is refreshed by strong breezes blowing in from the China seas. The westerly monsoon, being interrupted by the Straits of Malacca and the neighbouring lands, is scarcely felt. On the whole, the town is distinguished for its salubrity; and it is a remarkable fact, that notwithstanding that the settlement is surrounded by marshes, and is exposed to many of the causes which are usually supposed to create malaria, malignant remittent fever has not been known there since its formation. It is a question how far the healthiness of the situation may be attributed to the free ventilation which it enjoys; in other parts of the island, less favoured in this respect, it is stated that fevers and dysentery are frequent.

The Island of Penang, or Prince of Wales's Island, lies between $5^{\circ} 15'$, and $5^{\circ} 29'$ north Lat., and in Long. $100^{\circ} 25'$ east, being about 400 miles north of Singapore. It is separated from the adjacent coast of Queda by a channel two miles in breadth, which constitutes the harbour of the settlement.

The island is about 16 miles long from north to south, and on an average is 10 miles wide, the northern end being considerably wider than the southern. Almost the whole of the northern part is mountainous, and a range of hills, varying from 350 to 2,600 feet in height, runs through the centre of the island. On the eastern side of this range is a level country, nearly three miles in breadth, and on the western and southern sides there is also a considerable extent of level ground, most of which is now in a state of cultivation; and even the hills, which were formerly covered throughout with lofty trees, thickly interlaced with creeping and parasitical plants, have to a great extent been cleared by the hand of European industry, and are at the present day studded with villas and gardens, and diversified with flourishing plantations of the clove and nutmeg. The natural soil, however, of these elevated portions of the island, forms but a thin and sterile layer on the mass of granite of which they are composed, and in the valleys it scarcely exceeds a few feet in depth, consisting for the most part of disintegrated granite washed down from the neighbouring hills, clay and sand, with an occasional superstratum of light vegetable mould. The whole surface of the island, notwithstanding, presents an appearance of perpetual verdure, which is constantly sustained by the extremely moist nature of the climate, rain falling on an average every other day, and heavy dews prevailing in clear nights throughout the year. It is seldom that a fair morning is

succeeded by a fine day, and the changes from fair to rainy, as well as from hot to cold, are as sudden as they are frequent.

From observations registered at George Town, the capital of the island, situated in the eastern coast, it appears that the mean temperature, during the year, is between 79 and 80 degrees of Fahrenheit, the highest point reached being 90°, and the lowest 70½°; but on the hills the temperature is from 8° to 10° lower, and the daily range of the thermometer is limited generally to 3° or 4°.

The climate of Penang is somewhat more varied than that of Singapore, but it can scarcely be divided into seasons. In January and February less rain falls than in any other part of the year, and in the latter part of the year the heat is sometimes excessive; towards the end of March the monsoon begins to exert its influence, and in the two succeeding months, especially in May, the falls of rain are frequent, but seldom heavy. June is rainy, and squalls from the westward prevail, becoming occasionally of so violent a character as to resemble in their effects the hurricanes of the West Indies; they are happily, however, of short duration. In the following three months the sky is overcast, and much rain continues to fall. In these months the atmosphere, saturated with moisture, becomes occasionally extremely oppressive, producing sensations similar to those experienced in a vapour bath, and causing great languor and debility. The early part of October is generally clear and pleasant, but at the latter end of it, the north-east monsoon is observable, northerly winds prevail, the clouds collect in dense masses, and rain falls heavily and incessantly for many days together, attended with a great deal of thunder and lightning. To this succeed the cool and delightful months of November and December; at this period the frame is invigorated by the morning breeze, and the noon-day heat is subdued by frequent and refreshing showers, while the atmosphere is purer and more free from moisture than at any other part of the year.

Although the climate of Penang is in many respects trying to European constitutions, its salubrity is greatly superior to that of the Carnatic or the province of Bengal. The cool and bracing breezes which are always experienced during the night and mornings, enable the frame to support the greater heat of the day, and the variation of the thermometer is less than at any station on the continent of India. To invalids a short residence on the hills has frequently been attended with the happiest effects. The extreme beauty of the surrounding scenery, the diminished temperature, and the lightness and purity of the atmosphere, revive the spirits and renovate the constitution; their beneficial influence is sensibly felt even in a few days, and but a short time elapses before the bodily functions resume their proper conditions, and the bloom of English health is substituted for the sickly aspect of disease.

The town of Malacca is situated on the Malayan peninsula, in Lat. 2° 12' N., and Long. 102° 10' E., being about 300 miles to the south-east of Penang, and 150 miles north-west of Singapore. The territory to which it belongs extends for 40 miles along the coast, and 30 miles inland; its general character being mountainous, and its geological structure one uniform mass of cellular iron ore.

The town occupies an area of 500 yards in length, and 400 in breadth, and is bordered on the south by the sea, and on the east and north by a

river, which, running for 40 miles through a jungly and hilly country, discharges itself at this point into the sea. Immediately beyond the river rises St. Paul's hill, about 70 or 80 feet above the level of the sea, and beyond this again extends for some distance a flat and marshy country, abounding in exhalations. In its general character the climate of Malacca resembles that of Penang. The range of the thermometer is somewhat less, but the mean temperature is the same. The mornings are rendered delightfully cool by showers, which fall almost every evening and night, and the day seldom passes without thunder and lightning. The north-east monsoon commences about the end of November, or the beginning of December, and rain and chilling winds prevail more or less till the months of April and May, when the thermometer rises to 88°, and sometimes to 90°, and the afternoons are close and sultry. The south-east monsoon prevails throughout June, July, and August, and the weather is then clear and temperate. At times, however, occur violent storms, called Sumatrans, from their apparently directing their course from the opposite coast of Sumatra. The wind then rages with appalling violence, and peals of thunder shake the buildings to their foundations—vivid flashes of lightning intervene, and a deluge of rain continues to fall for two or three hours after the storm is lulled. September is generally fine, with a steady breeze from the south-east. October and November are commonly rainy, with strong winds from the north-west.

The features which render Penang a desirable resort for invalids, are to be recognised at Malacca, and, like Penang, it rejoices in a moderate temperature, and slight variation of the thermometer throughout the year. It must, however, be borne in mind, that what has been said with respect to the favourable influence of these two stations, applies principally to their effect on European constitutions. The native troops, as will be seen by reference to page 146, suffer considerably more than at Moulmein.

Having given this general description of the localities, your Committee will now proceed to shew their influence on the different classes of troops, by numerical results.

I.—MOULMEIN.

The European force stationed at Moulmein consisted, up to 1838, of a regiment of H. M. Infantry, and a detachment of Artillery. In 1838 it was increased by another regiment of infantry, in consequence of the apprehensions of war with Burmah. The mean strength of the European force throughout the whole period was 974. The native troops likewise consisted of one regiment of infantry, until 1838, when another regiment was added, and of a company of gun lascars, with a small body of pioneers, sappers, and miners. The average of this force throughout the period was 1,156.

The two following tables exhibit the mean force, with the number of admissions into hospital and of deaths, during each year of the period under observation.

Statement of the Mean Strength, the Number of Admissions into Hospital, and Deaths, with the Ratio of Admissions and Deaths to the Mean Strength, among the European and Native Troops separately, at Moulmein, on the Tenasserim Coast, in each Year from 1829 to 1838.

EUROPEANS.					
YEARS.	Mean Strength.	Admissions.	Deaths.	Ratio per 1000 of Mean Strength.	
				Admitted.	Died.
1829	946	1,629	41	1,722·	43·3
1830	971	1,594	26	1,642·	26·7
1831	933	1,515	23	1,624·	24·9
1832	882	1,414	43	1,603·	48·7
1833	848	864	23	1,019·	27·1
1834	598	1,607	114	2,687·	190·6
1835*	..	..	..	..	..
1836	897	1,406	25	1,567·	27·8
1837	876	1,570	33	1,792·	37·6
1838	1,441	2,544	59	1,765·	40·9
Total, exclusive of 1834-35	7,794	12,536	273	..	..
Average	974	1,567	34	1,592·	34·6
NATIVES.					
1829	1,560	1,666	13	1,068·	9·6
1830	1,143	1,323	27	1,152·	23·5
1831	1,062	1,134	11	1,068·	10·3
1832	1,136	884	11	778·	9·6
1833	1,094	830	11	759·	10·0
1834	996	583	10	585·	10·0
1835	966	528	9	547·	9·3
1836	967	706	16	730·	16·5
1837	1,008	541	24	537·	23·8
1838	1,625	1,106	35	681·	21·5
Total	11,562	9,301	169	..	..
Average	1,156	930	16·9	804·	14·6

With regard to the first table, relating to European troops, it must be remarked, that the excessive sickness and mortality in the year 1834 arose entirely from the following circumstances attending the arrival of H. M. 62nd regiment. This regiment was attacked with cholera, on its march from Bangalore to Masulipatam, in the commencement of the year 1833, and lost 56 out of 590 men. On its arrival

* H. M. 62nd Regiment was transferred to the Bengal Presidency in January, 1835, and furnished no return to the Madras Government till November, 1835, when it was transferred back to the Madras Presidency. The accounts, therefore, for this year are too incomplete to be inserted.

at the latter place, it suffered still more dreadfully from fever and dysentery, about 170 deaths having taken place during the 15 months it remained there, and the extent of sickness was so great that when it was ordered to remove to Moulmein as a more healthy station, there was scarcely a man fit for duty. Of the 380 who embarked, 17 died on the voyage; and those who landed were in such a condition, that the removal from the ship to the hospital proved fatal to several. In many, organic diseases supervened upon frequent attacks of fever, and diarrhoea and debility were so general, that many deaths took place therefrom within a short period after their arrival, all of which, including the deaths on ship-board, and even some at Masulipatam, were included in the returns of this regiment for 1834.

Since, therefore, this extraordinary fatality was the result of another climate, and can in no wise be attributed to any circumstances connected with Moulmein, as is proved by the healthiness of the Artillery in the same year, it becomes necessary, in the following comparisons, to exclude the returns for the year 1834; and the same course must be adopted for the year 1835, because, owing to the temporary transfer of the same (62nd) regiment from the strength of the Madras to that of the Bengal presidency, no medical returns were received from it at Madras for several months. With these preliminary observations, we will examine the tables more minutely.

1. *European Troops at Moulmein.*—It appears from the first table, that the average of the mean annual strength of European troops at Moulmein, from 1829 to 1838, excluding 1834 and 1835, was 974. The average annual number of admissions into hospital during that period, was 1,592 per 1,000, and of deaths, 34 per 1,000. The greatest sickness in any year, excepting 1834, was in 1837, when the number of admissions was 1,792 per 1,000. In 1834 it was 2,687 per 1,000. The least sickness was in 1833, when the admissions were only 1,018 per 1,000; in the next most favourable year (1836), they were 1,567 per 1,000.

The greatest mortality in any year, excepting 1834, when, from the causes already stated, it amounted to 190 per 1,000, was in 1832, when it reached 48 per 1,000; the lowest occurred in the preceding year, when it was only 24 per 1,000.

As the average annual number of admissions, during the whole period, was 1,592, each man was on an average admitted into hospital once in 7 months. The difference in the most unfavourable year is not great, and the fluctuation throughout the period was inconsiderable, with the exception of the year 1833, in which the amount of sickness was unusually small.

A comparison between the admissions into hospital and the deaths, shews, as might be expected, that the ratio of mortality does not necessarily coincide with that of sickness; for while, in one year catarrhs, or syphilis, or rheumatism, may be very prevalent, and swell the hospital lists considerably, the mortality may be comparatively light; and the very prevalence of those complaints which bring men under regime and medical surveillance, may actually prevent them from incurring other and more fatal diseases. The opposite proposition is equally true. The admissions may in the aggregate be few, but if the majority of them arise from liver and other dangerous diseases, the number of deaths would, in such a case, be comparatively great.

The returns from this station, compared with those from the Madras Presidency, exhibited in the first Report, shew that Moulmein is much more favourable to the health of the European troops, than that part of the continent of India. In Madras, on the average of the 12 years, from 1827 to 1838, the number of admissions among Europeans was 1,838 per 1,000, and of deaths, 48 per 1,000; while at Moulmein, during the 8 years from 1829 to 1838, excluding 1834-35, for the reasons before-mentioned, the admissions were only 1,592 per 1,000, and the deaths 34 per 1,000.*

It is however proper to state, that in 1827, the year preceding the series of returns which your Committee have had laid before them, a great amount of sickness and mortality prevailed at Moulmein, which, if that year had been included, would have brought the ratio of mortality nearly on a level with that which occurred at Madras. But the sickness which then proved so fatal was in a great measure to be attributed to the effects of the service of the troops in the Rangoon war, together with the nature of their employment, and their necessary exposure to many hardships, on their first arrival at Moulmein, which was then an uninhabited, uncleared spot, covered with wood, and where they had to encamp in tents until they had cleared the ground and built huts for themselves. No epidemic or endemic disease has prevailed at Moulmein since the troops have been stationed there, with the exception of a slight visitation of cholera in 1827; and so healthy is it considered by the medical officers of the Madras presidency, that it has been proposed to establish a sanatorium there for the invalid soldiers of that establishment, who would, under other circumstances, be discharged from the service, or sent to England.†

2. *Native Troops in Moulmein.*—The average of the mean annual strength of the native troops at Moulmein, from 1829 to 1838, was 1,156, among whom the ratio of admissions into hospital was 804 per 1,000, and of deaths 14 per 1,000. Compared with the Madras presidency, the admissions are nearly one-third more numerous, but the deaths about one-tenth less. The highest rate of admissions in any one year, was 1,152 per 1,000, and the lowest was 536 per 1,000; the former occurred in 1830, and the latter in 1837. The greatest mortality took place in the last year, when the number of admissions was smallest; it amounted to 23 per 1,000; while the least mortality, which occurred in 1835, was only 9 per 1,000.

It is deserving of notice, that the mortality during the last five years

* If the comparison be made with the returns for the corresponding years in Madras, the difference is less considerable; for in the 8 years from 1829 to 1838, excluding 1834-35, the admissions there averaged 1,748 per 1,000, and the deaths 45 per 1000. A similar rectification is not necessary as regards the native troops, since the exclusion from the Madras Returns of the two years 1827-28, for which no returns are furnished from Moulmein, has a very trifling influence upon the average.

† Moulmein was considered so healthy for European troops, that an experiment was made in 1836-37, of sending a number of artillerymen who were recommended to be discharged as unfit for the service by an invaliding committee; the result of which was highly favourable, as the greatest part of the men returned in perfect health, and were accordingly restored to the service. From this circumstance, it was thought that a sanatorium established at Moulmein for Europeans, would prove advantageous to the service, by restoring health to many men who would otherwise be lost to it, and thus prove a saving to the government both of men and of money.

among the native troops, has been very much higher than during the first five, in the proportion of 16·2 to 12·6 per 1,000; while among the Europeans, the increase during the last three years (for which alone the returns are complete), compared with the first three, is from 31·6 to 35·4 per 1,000. The increased mortality among the natives was accompanied by a nearly corresponding *diminution* in the number of admissions, which affords further testimony to the correctness of a previous observation, that there is not of necessity any correspondence between the annual ratios of sickness and mortality.

II.—PENANG, SINGAPORE, AND MALACCA.

1. *European Troops stationed at Penang.*—The annual aggregate strength of the European troops at Penang, during the ten years, was only 513, or an annual average strength of 51·3; a number so small compared with those in the other tables, as to render it unadvisable to pursue a minute enquiry on such data. The chief points worthy of remark are the greatly diminished ratio of mortality as compared with Moulmein, accompanied by a considerable increase of admissions. The deaths at Moulmein were 34·6, and at Penang, as shewn in the following Table, 17·7 per 1,000, or exactly one-half as numerous. The admissions at Moulmein were 1,591, and at Penang 2,193 per 1,000, or about one-third more numerous at the latter place.

Statement of the Mean Strength of the European Troops stationed at Penang, and of the Number of Admissions into Hospital and Deaths, with the Ratio thereof to the Mean Strength, in each Year from 1829 to 1838.

Years.	Mean Strength.	Admissions.	Deaths.	Ratio per 1000 of Mean Strength.	
				Admitted.	Died.
1829	35	81	..	2,314·	..
1830	37	66	..	1,784·	..
1831	57	126	1	2,211·	17·5
1832	61	204	2	3,344·	32·7
1833	54	162	3	3,000·	55·5
1834	54	153	..	2,833·	..
1835	50	125	1	2,500·	20·0
1836	56	65	1	1,161·	17·8
1837	54	71	1	1,315·	18·5
1838	55	81	..	1,473·	..
Total	513	1,134	9	..	..
Average	51	113	·9	2,193·	17·7

It has been suggested that the diminished mortality among the European troops at Penang, as compared with Moulmein, is owing to the circumstance of the corps at the former place consisting solely of artillery, who are generally reputed to be more healthy than troops of the line; either on account of the superior regulations and habits observed in their service, or of a higher scale of pay. This supposition, however,

is not well founded, as it has been ascertained that there has been no difference in the rate of mortality prevailing among the artillery and infantry serving at Moulmein.

2. *Native Troops at Penang, Singapore, and Malacca.*—The average annual mean strength of the native troops at Penang, Singapore, and Malacca, during the ten years from 1829 to 1838, was 1,994: the force was at the highest in 1832, when its mean strength amounted to 3,011; and in 1829 it was at the lowest, its mean strength being 1,529. The average number of admissions was 1,008 per 1,000; and the average number of deaths 20 per 1,000.

Statement of the Mean Strength of the Native troops, stationed at Penang, Singapore, and Malacca, and of the Number of Admissions into Hospital and Deaths, with the Ratio thereof to the Mean Strength, in each Year from 1829 to 1838.

Years.	Mean Strength.	Admissions.	Deaths.	Ratio per 1000 of Mean Strength.	
				Admitted.	Died.
1829	1,529	1,989	38	1,301·	24·8
1830	1,953	2,039	27	1,044·	13·8
1831	2,270	2,133	29	940·	12·7
1832	3,011	4,955	87	1,646·	28·8
1833	2,250	2,406	66	1,069·	29·3
1834	1,690	1,649	46	976·	27·2
1835	2,135	1,829	32	857·	14·9
1836	1,699	1,084	26	638·	15·8
1837	1,597	1,065	25	667·	15·6
1838	1,807	952	24	527·	13·2
Total	19,941	20,101	400	..	..
Average	1,994	2,010	40	1,008·	20·0

But during the years 1832-33 these troops were engaged in the field in Malacca, which caused a great increase of sickness and mortality in the returns for that period. If these two years be deducted, the average number of admissions will be reduced to 867 per 1,000, and that of deaths to 16·8 per 1,000. The former ratio is one-eighth higher than at Moulmein, and one-fourth higher than at Madras; the latter is one-seventh higher than at Moulmein, but merely a fraction higher than at Madras.

III.—DISEASES.

The following table exhibits the principal diseases with which the European and native troops were attacked, and the number who died of each class of disease, at the stations on the Tenasserim Coast. The returns do not furnish the means of separating the stations, but this is not of much consequence as regards European troops, since their number at Penang is too small to afford an average for separate investigation.

*Statement of the Aggregate Strength of European Troops at Moulmein and Penang, and of the Native Troops at Moulmein, Penang, Singapore, and Malacca, of the Total Number of Admissions and Deaths among the whole force, and of the Annual Ratio per 1,000 of Mean Strength, distinguishing the principal diseases, in the 10 Years from 1829 to 1838.**

Diseases, according to Tulloch's Classification.	Diseases, according to Classification in the Moulmein Medical Returns.	EUROPEANS. Aggregate Strength of 8 Years, 8,207.				NATIVES. Aggregate Strength of 10 Years, 31,503.			
		Admissions.		Deaths.		Admissions.		Deaths.	
		Total Number among whole Force in 8 Years.	Ratio per 1,000 of Mean Strength.	Total Number among whole Force in 8 Years.	Ratio per 1,000 of Mean Strength.	Total Number among whole Force in 10 Years.	Ratio per 1,000 of Mean Strength.	Total Number among whole Force in 10 Years.	Ratio per 1,000 of Mean Strength.
Fevers	Fevers	3,608	440	65	7.92	9,371	298.	116	3.68
Eruptive Fevers	„	„	„	„	„	„	„	„	„
Diseases of the Lungs	Hepatitis	651	79	29	3.55	„	„	„	„
„ „ Liver	Diarrhoea	976	119	12	1.46	1,340	42.	6	.20
„ „ Stomach	Dysentery	1,370	167	84	10.24	629	20.	71	2.25
„ „ and Bowels	Cholera	46	6	23	2.80	13	.4	39	1.24
Epidemic Cholera	„	„	„	„	„	„	„	2	.06
Diseases of the Brain	„	„	„	„	„	„	„	„	„
Dropsies	Rheumatism	574	70	5	.61	2,759	87.	47	1.49
Rheumatic Affections	Syphilis	1,018	124	3	.36	1,202	38.	6	.19
Veneral „	Ulcers	597	72	„	„	3,305	105.	12	.38
Abscesses and Ulcers	„	„	„	„	„	„	„	„	„
Wounds and Injuries	„	„	„	„	„	„	„	„	„
Panished „	Ophthalmia	188	23	„	„	309	10.	1	.03
Diseases of the Eye	„	„	„	„	„	„	„	„	„
„ „ Skin	Other Diseases	4,364	532	60	7.31	10,436	331.	269	8.54
„ „ other Diseases	Total	13,392	1,632	281	34.25	29,402	983.	569	18.06

* Omitting the Returns of European Troops for the years 1834 and 1835, for the reason previously stated at p. 143.

EUROPEAN TROOPS.		
Mean Annual Strength of Force during 8 Years.	Annual Ratio of Admissions per 1000 of Mean Strength.	Annual Ratio of Deaths per 1000 of Mean Strength.
1,025	1,632	34·25

During the eight years' service of the European troops at Moulmein and Penang, from 1829 to 1838, excluding, for the reasons already stated, the returns for Moulmein in 1834 and 1835, the aggregate strength was 8,207, and the average annual strength, 1,025. The annual ratio of admissions per 1,000 was 1,632, and the annual ratio of deaths to the same standard, 34·25.

Fever is the most prevalent disease among these troops, the admissions from this cause being 440 per 1,000, or more than one-fourth of the total number. The mortality from fever is 7·92 per 1,000, which is considerably less than that caused by dysentery.

Dysentery and Diarrhœa rank next in prevalence; the admissions from these diseases being 286 per 1,000; but in fatality they stand much higher than fever, the proportion of deaths being 11·70 per 1,000, of which 10·24 are caused by dysentery, diarrhœa proving fatal only to 1·46 per 1,000.

Syphilis appears to have been very prevalent, and presents itself next in order. The admissions caused by this disease were 124 per 1,000. It proved fatal in 3 cases during the eight years, or 0·36 per 1,000.

Hepatitis, although comparatively infrequent, causes a mortality nearly equal to half of that occasioned by fever. The admissions from this disease were 79, and the deaths 3·55 per 1,000.

Ulcers caused 72, and *Rheumatism* 70 admissions per 1,000. The former did not prove fatal in a single case; the latter only in 5, or 0·61 per 1,000. *Ophthalmia* occasioned 23 admissions per 1,000.

Cholera stands lowest in regard to the number of admissions that it caused, which were only 46 in the eight years, or 6 per 1,000; but it was by far the most fatal disease, the deaths being exactly one-half of the number attacked, *viz.*, 23, or 2·80 per 1,000 of the mean strength.

Diseases of the Lungs have been classed with other diseases, which prevents any definite conclusions as to the influence of that class on the European constitution in these climates.

The miscellaneous diseases amounted to 532 per 1,000, or nearly one-third of the total admissions; and the deaths which they occasioned were 7·31 per 1,000, which proportion is nearly one-fifth of the total mortality.

NATIVE TROOPS.		
Mean Annual Strength of Force during 10 Years.	Annual Ratio of Admissions per 1000 of Mean Strength.	Annual Ratio of Deaths per 1000 of Mean Strength.
3,150	933	18·06

In illustration of the healthiness of the native, as compared with the

European troops, it will be perceived that the annual ratio of admissions and deaths from all classes of disease was in both cases nearly twice as great among the latter force. The admissions per 1,000 were 1,632 among the Europeans, and 933 among the natives. The deaths per 1,000 were 34 among the Europeans, and 18 among the natives.

Fever is the most prevalent disease among the native, as well as among the European troops, the admissions from this cause being 298 per 1,000; which, although one-third less than the number among the European force, is a much greater proportion of the total number of diseases, in the ratio of a third to a fourth. The deaths from this cause are 3·68 per 1,000, or less than half the ratio which occurs among the European troops. But the sickness and mortality from fever among the natives is raised somewhat above the average by the excess in this class of diseases, which occurred during the employment of the troops upon active service in Malacca during the years 1832-33. In 1832 alone, the admissions for fever were nearly double, and the deaths were more than double, the average of the remaining period.

Ulcers, with the natives, are next in frequency, the proportion of admissions from this class of disease being as great as 105 per 1,000. They are also of a more aggravated character, as they occasioned death in 12 cases, or 0·38 per 1,000; while among the Europeans there was not any death from this cause.

Rheumatism presents itself next in order, the admissions being 87 per 1,000, which is one-fourth higher than among the European troops; while the deaths are 1·49 per 1,000, or more than double the proportion among the last-named force. It is worthy of remark, that rheumatism and ulcers are the only diseases specified by name which prevail to a greater extent, and cause a greater mortality among the natives than among European troops on these stations. Their frequency and severity among the natives, are, in fact, the causes of their being specially noticed in these returns.

Diarrhœa and Dysentery rank next in frequency; the admissions averaging 62 per 1,000, or less than one-fourth of the proportion among the European force. The mortality arising from these diseases is 3·49 per 1,000, which is nearly equal to that caused by fever among the natives. Compared with the mortality from the same diseases among the European force, it amounts to less than one-third; but there is this difference, which is not observable in the return from the Madras Presidency, that whereas among the Europeans dysentery carried off a greater proportion of the cases than diarrhœa, in the ratio of 7 to 1, —among the natives, on the contrary, diarrhœa caused nearly twice as many deaths as dysentery. This remarkable difference appears to indicate the superior power of the European constitution, derived in a great measure from a better quality of diet, to withstand the attacks of these diseases; for while the native, living chiefly upon vegetable food, sinks rapidly under an attack of diarrhœa, a victim to the debility arising from want of adequate nutrition, the European is seldom cut off by diarrhœa, except in cases in which it has supervened upon frequent attacks of dysentery, of which it often proves the fatal sequelæ.

Syphilis occasioned 38 admissions per 1,000 of the force, which is about one-third of the admissions from the same cause among the Euro-

peans ; but it was more fatal to the natives, as among them the proportion of deaths to the number of admissions from this disease, was 1 in 200, while among the Europeans it was 1 in 239.

Hepatitis is of very rare occurrence, furnishing only 38 cases, or 1 per 1,000. It was, however, of a fatal character, as nearly 1 in 6 of the attacks proved fatal; although, as the number of admissions was so small, the deaths formed a very small fraction (0·20 per 1,000) of the total mortality. Among the Europeans, the proportion of fatal cases was only 1 in 32, the difference arising probably from the cause previously noticed, *viz.*, the inferior constitutional stamina of the natives, and their consequent inability to withstand acute diseases.

Ophthalmia.—The admissions from this cause among the natives were 10 per 1,000 of the mean strength, which is not one-half of the proportion that prevailed among the Europeans. One native is stated to have died of this complaint, but it is obvious that some other disease must have supervened.

Cholera is even more rare among the natives than among the Europeans, the admissions having amounted to only 0·4 per 1,000. The mortality arising from it was very much less, being only one death in 6½ of the cases attacked, or 0·06 per 1,000 of the mean force.

The miscellaneous diseases occasioned 331 admissions per 1,000, or more than one-third of the total number; while the mortality from the same class was 8·54 per 1,000, or nearly one-half of the whole number of deaths, which is a considerably larger proportion than among the Europeans, with whom the deaths from the miscellaneous class of diseases formed less than a fourth of the total mortality. This difference arises from the fact that in the miscellaneous class of diseases prevailing among the natives, there are many which arise from excessive debility and exhaustion, under which the native Sepoy sinks, but which are not, and cannot be, classed under any specific head. They arise purely from exhaustion, the effect either of direct debility, or of indirect debility from over excitement, such as too free an indulgence of the sensual passions, or the excessive use of stimulants to excite desire.

The general results, as far as can be gathered from these returns, are, that at the stations under examination dysentery is the most fatal disease among Europeans, and fever among the natives; that the natives are cut off much more frequently by diarrhoea than by dysentery; that liver complaints are very rare among the natives, but that they are very subject to rheumatism and ulcers, which occasion a mortality unknown to the European troops. An explanation of the difference as regards diarrhoea and dysentery has already been attempted, and the same reasons apply equally to rheumatism and ulcers.

IV. SICKNESS AND MORTALITY OF EUROPEANS AND NATIVES AT MOULMEIN, &c. COMPARED WITH MADRAS.

The medical returns from the Tenasserim Provinces do not furnish the same details relating to the diseases which have prevailed among the troops, as those received from the Madras Presidency; several, however, of the principal diseases which affect the troops in the climate of India, being those which most frequently render the men unfit for

duty, are distinguished; and in the following table the results are exhibited, in connexion with the returns relating to the same diseases among the troops in the Madras Presidency, which are contained in your Committee's former Report.

*A Comparative Statement of the Sickness (as shewn by the number of admissions into Hospital) and Mortality of the European and Native Troops, at Madras, and at Moulmein (on the Tenasserim Coast), Penang, Singapore, and Malacca, distinguishing the principal diseases, in the 10 years from 1829 to 1838.**

DISEASES.	EUROPEANS.				NATIVES.			
	Admissions.		Deaths.		Admissions.		Deaths.	
	Madras.	Moulmein, &c.	Madras.	Moulmein, &c.	Madras.	Moulmein, &c.	Madras.	Moulmein, &c.
	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.	Annual Ratio per 1000 Mean Strength.
Fever . .	349	440	5·57	7·92	189·	298·	3·53	3·68
Hepatitis . .	116	79	5·62	3·55	·9	1·6	·11	·20
Diarrhœa . .	78	119	1·55	1·46	16·	42·	·86	2·25
Dysentery . .	188	167	15·03	10·24	9·6	20·	1·00	1·24
Cholera . .	27	6	7·6	2·80	9·	·4	4·04	·06
Rheumatism . .	102	70	·95	·61	53·	87·	·80	1·49
Syphilis, &c. .	192	124	·57	·36	23·	38·	·16	·19
Ulcers . .	74	72	·22	·	42·	105·	·37	·38
Ophthalmia . .	72	23	·06	·	11·	10·	·02	·03
Other Diseases	640	532	11·46	7·31	261·5	331·	5·24	8·54
Total . .	1,838	1,632	48·63	34·25	615·	933·	16·13	18·06

Upon an investigation of this table, it appears that *Fever* caused among the European troops at Moulmein † 440 admissions per 1,000 of the mean strength, while in Madras it caused only 349 admissions per 1,000. The excess, therefore, at Moulmein is rather more than one-fourth. But the contrast is still more unfavourable as regards the mortality, since in Madras the deaths were 5·57 per 1,000, while at Moulmein they were 7·92 per 1,000, an excess of more than one-third. The same differences do not exist among the native troops in the two localities, as the excess of admissions on the Tenasserim coast is still greater, or 298 compared with 189 per 1,000; while there is scarcely any difference in the ratio of mortality, which varies only from 3·53 per 1,000 in Madras, to 3·68 per 1,000 at Moulmein.

Hepatitis caused 79 admissions per 1,000 among the European troops

* Omitting, as before, the returns of European troops for the years 1834 and 1835.

† In the following comparisons the name of the principal station on the Tenasserim coast, Moulmein, is used to represent all the stations in those provinces, and in the same manner Madras stands for the whole of the continental portion of the Madras Presidency.

at Moulmein, and 116 per 1,000 among the same class in Madras. In nearly the same ratio the deaths at Moulmein were 3·55 per 1,000, and those in Madras 5·62 per 1,000, the excess in the latter locality being in both instances about one-half. The native troops present only a trifling difference in this disease in the two localities, as in both it is one of the disorders which affect them least. The admissions do not in either locality exceed 1 in 1,000, and the deaths vary from 0·11 per 1,000 in Madras, to 0·20 per 1,000 on the Tenasserim coast.

Diarrhœa and Dysentery exhibit some rather curious anomalies in the two localities. Among the European troops the admissions for diarrhœa were 78 per 1,000 in Madras, and 119 per 1,000 at Moulmein, an increase of more than one-half at the latter station; while the deaths were somewhat less, or 1·46 compared with 1·55 per 1,000. The admissions for dysentery, on the other hand, were less at Moulmein, in the proportion of 167 to 188 per 1,000; while the deaths were one-third less, or 10·24 instead of 15·03 per 1,000. Among the natives both the admissions and deaths caused by diarrhœa were nearly three times as numerous at Moulmein as in Madras; the former being 42 compared with 16 per 1,000, and the latter being 2·25 compared with 0·86 per 1,000. The admissions for dysentery, also, were twice as numerous at Moulmein, or 20 compared with 9·6 per 1,000; but the deaths were only one-fourth more numerous, or 1·24 compared with 1· per 1,000.

Cholera appears to have been far less prevalent among both classes of troops at Moulmein than in Madras. As, however, this is a disease possessing somewhat of a periodical character, and the returns from the Tenasserim provinces do not extend over an equal number of years as those furnished from the Madras peninsula, the following results may be liable to modification. Among the European troops the admissions were 27, and the deaths 7·6 per 1,000 in Madras, and only 6 and 2·8 per 1,000, respectively, in the Tenasserim provinces. Among the native troops the admissions and deaths were 9 and 4·04 per 1,000 respectively in Madras, and 0·4 and 0·06 per 1,000 respectively at Moulmein.

Rheumatism is remarkable for the contrast exhibited by the two classes of troops. Among the Europeans both the admissions and deaths are considerably less at Moulmein than in Madras, in the proportion of 70 to 102 admissions per 1,000, and 0·61 to 0·95 deaths per 1,000. But among the native troops there is a difference as great on the other side. The admissions were 87 to 53 per 1,000, and the deaths 1·49 to 0·80 per 1,000. The greater susceptibility of the natives to rheumatism on this coast may be attributed partly to the greater coolness of the climate as compared with the continent of India, and partly to the want of sufficient nourishment, of which the Sepoy is frequently wont to deprive himself while on foreign service, and to the want of that care and attention which he receives from his family when serving at home.

Ulcers also exhibit a very large increase of admissions among the native troops, *viz.*, 105 compared with 42 per 1,000, but the ratio of deaths is nearly the same (0·38 and 0·37 per 1,000) in both localities. Among the European troops the admissions were almost the same, but there were no deaths from this cause at Moulmein, while in Madras the deaths amounted to 0·22 per 1,000.

With regard to *Syphilis* there is a considerable decrease both of admis-

sions and deaths among the European troops, and a corresponding increase among the native troops. Of cases of *Ophthalmia* there is a great decrease among the European troops at Moulmein, and little variation among the native force.

There remains a large class of miscellaneous diseases, to which must be added those diseases which are distinguished in the returns from the Madras provinces, but not in those from the Tenasserim coast. These have produced among the European troops much less sickness and mortality in the latter locality than in the former. The admissions were respectively 532 and 640 per 1,000, and the deaths 7·31 and 11·46 per 1,000. Among the natives, on the other hand, there is a large increase, the admissions being respectively 331 and 261 per 1,000, and the deaths 8·54 and 5·21 per 1,000.

The general results of the table, taking all the diseases together, indicate that the Tenasserim coast, as compared with the continental portion of the Madras presidency, is favourable to Europeans, but not equally so to native troops. With regard to admissions into hospital, the ratio per 1,000 among Europeans was 1,838 in Madras, and 1,632 at Moulmein, which is equal to a decrease of one-ninth in the latter quarter. But among the natives the ratio per 1,000 of total admissions at Moulmein, &c. was 933, and if the returns from Malacca in the years 1832-33 be excluded, 832, while it was only 615 in the Madras provinces, so that there was an increase, in the latter case, of just one-third. The difference in the mortality was equally striking among the European troops. In Madras, the deaths were 48 per 1,000; at Moulmein they were only 34 per 1,000, a decrease of nearly one-third. Among the natives, however, they had increased from 16 to 18 per 1,000 on the total average, and had decreased to 15·5, if the Malacca returns for 1832-33 be excluded.

It is stated by a competent authority that one of the chief causes of the increased sickness among natives on foreign service, (as service on this coast is called,) is, first, an anxious longing desire to return to their families, whom they have left behind in India, which has a powerfully depressing influence on the mind of Sepoys; and, secondly, great privations, arising from a strong desire on their part to save as much of their pay as they possibly can in order to send it to their families; to these two causes may chiefly be attributed the increased sickness and mortality of Sepoys absent from their homes. In order, however, to guard against misapprehension on this head, it may be right to observe, that when any part of the native force is detached from the continent upon service to any of the out-stations in the Indian ocean, the government always authorises family certificates to be granted to each man, which enable the family to receive a certain proportion of pay monthly during their absence; and if any man dies while absent on duty, his family receives a pension. Notwithstanding this arrangement, which is always gratefully felt by the Sepoys, they have still the desire to hoard up their pay to send to their families, and thus deprive themselves of the necessary nourishment actually required to keep them in health. This fact has often been brought to notice, and there is reason to believe that arrangements have been made to prevent the evil; but it is difficult to interfere with the diet of Sepoys, and the task of amelioration is not easy of accomplishment.

There is also a remarkable difference in the nature of the diseases which produce mortality. Among the European troops there was a considerable increase of fever, but a decrease in almost every other class of disease, particularly in dysentery, cholera, and liver complaints. Among the natives, on the other hand, there was no increase of mortality from fever, although there was a great increase of sickness from that cause; but there was a large increase from diarrhœa, dysentery, and rheumatism. These differences are pointed out in a condensed form in the following table, and their probable causes have been already noticed.

DISEASES.	EUROPEANS.				NATIVES.			
	Admissions.		Deaths.		Admissions.		Deaths.	
	Difference per 1000 as compared with Madras.		Difference per 1000 as compared with Madras.		Difference per 1000 as compared with Madras.		Difference per 1000 as compared with Madras.	
	Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.	Increase.	Decrease.
Fever . .	91	..	2·35	..	109·	..	15·	..
Hepatitis .	..	37	..	2·07	·7	..	·09	..
Diarrhœa .	41	..	·09	..	26·	..	13·9	..
Dysentery .	..	21	..	4·79	10·4	..	·24	..
Cholera	21	..	4·80	..	8·6	..	3·98
Pneumatism.	..	32	..	·34	34·	..	·69	..
Syphilis, &c. .	..	68	..	·21	15·	..	·03	..
Ulcers	2	..	·22	63·	..	·01	..
Ophthalmia .	..	49	..	·06	..	1·	·01	..
Other Diseases	..	108	..	4·15	70·	..	3·29	..
Total	206	..	14·38	318	..	1·93	..

It remains only to shew how the Tenasserim coast ranks with regard to salubrity, in comparison with the other stations in which British troops are employed. Your Committee have abstained from making this comparison in their investigation into the several diseases, from an apprehension that some differences, which the returns do not afford the means of detecting, may exist in the method of classifying the diseases. They confine themselves therefore to a statement of the general results.

From the following table it appears that although the Tenasserim coast is considerably more favourable to European constitutions, than that part of the continent of India which belongs to the Madras Presidency, it is much more unfavourable to them than any of the European or African colonies, with the exception of Sierra Leone. The West Indies far exceed even the continent of India in insalubrity.

	RATIO per 1000.			
	Admissions.		Deaths.	
	Europeans.	Natives.	Europeans.	Natives.
United Kingdom, <i>viz.</i> —				
Dragoon and Dragoon Guards	929	..	14•	..
Gibraltar	966	..	21•4	..
Malta	1,142	..	16•3	..
Ionian Islands	1,201	..	25•2	..
Sierra Leone	2,978	812	483•	30•1
St. Helena	738	..	25•4	..
Cape of Good Hope, Cape District	991	..	13•7	..
„ Eastern Frontier	866	823	9•8	10•9
Mauritius	1,249	839	27•4	37•
Canada	1,097	..	16•1	..
Nova Scotia and New Brunswick	820	..	14•7	..
Bermudas	1,310	..	28•8	..
Windward and Leeward Islands.	1,903	820	78•5	40•
Jamaica	1,812	172	121•3	30•
Madras Presidency	1,838	615	48•6	16•1
Tenasserim Coast	1,632	832*	34•2	15•5*

* Excluding the returns from Malacca for the years 1832-33.

Your Committee have much pleasure in presenting this Report, believing that it may be productive of much benefit, by pointing out how differently the two races of men composing the British army on the Tenasserim coast are affected under a climate to which they are both, though not equally, strangers; and hoping that the results will lead to further enquiry as to the causes which influence these differences, as well as those which have been shewn in the preceding comparisons to prevail among the same classes of troops on the continent of India, and the detached stations on the Tenasserim coast.

It is desirable to ascertain what influence the nature of the climate has in producing this difference. The Tenasserim coast is certainly cooler, and exposed to smaller variations of temperature than the Indian continent; it is therefore more congenial to the European constitution, and for the same reason cannot be so congenial to the natives of the hotter climate. But it remains to be investigated how far the other circumstances mentioned in the Report operate injuriously on the health of the Sepoys, *viz.*, the absence of the men from their families, depriving them of the domestic care and comfort which they possess at home, and in many cases causing nostalgia, together with the self-deprivation which the desire of saving their pay for their families encourages among one class, and the debauchery which the separation from their families excites among another.

The results of the present enquiry may, it is hoped, facilitate in some degree this investigation, and lead to the adoption of measures calculated to alleviate or remove the evils under which the Sepoys labour in these provinces, and to turn to the best account the advantages which the climate seems to hold out to Europeans.